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UNITED STATES BUREAU OF MINES
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GEOPHYSICAL ABSTRACTS

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BY

FREDERICK W. LEE

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DEPARTMENT OF COMMERCE - BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 16.

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

ISOSTASIA ED ONDULAZIONI DEL GEOIDE IN RAPPORTS ALLE ANOMALIE GRAVIMETRICHE ED ALLE DEVIACIONI DELLA VERTICALE

(ISOSTASY AND UNDULATIONS OF THE GEOID WITH RELATION TO THE GRAVIMETRIC ANOMALIES AND DEVIATION FROM THE VERTICAL)

By Mario Bossolasco

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 14-26.

The author examines the consequences resulting from the negligence of Bruns' terms in the proceedings used, so far, for the derivation of empirical formulas by Helmert, Hayford, Heiskanan, etc.; he comes to the conclusions that the importance and validity of these formulas are considerably restricted by this negligence. Furthermore, the gravity disturbances $g-\gamma'$ can not be brought into relation with the true figure of the geoid and the position of the equatorial ellipse established by rough approximation of the geoid as a three axial ellipsoid is correct.

The author shows a simple and practical method of obtaining by measurements of gravity the true figure of the the geoid, that is, its undulations relating to a referred ellipsoid. Finally, in discussing the deviations from the vertical, he makes clear the uncertainty of the method used ordinarily for computing topographic deviations from the vertical. From all of these considerations he draws the conclusion that any positive geodetic basis for the isostatic theories is lacking.--Author's abstract translated by W. Ayvazoglou.

TEMPERATURE CHANGES BETWEEN TORSION BALANCE READINGS IN THE STATE OF TEXAS

By Sidon Harris

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 171-172.

The purpose of this investigation was to determine the magnitudes of the temperature changes between readings of torsion balances in the State of Texas through the entire year. The period of investigation extends from September, 1926, to February, 1930. A total of 14,799 readings was taken. A table shows the percentage of readings falling within the indicated increments.

Considering the average values for the entire investigation, the author states that roughly 90 per cent of the readings give temperature increments smaller than 2.5° C.; in other words, in 90 per cent of the readings the temperature changed less than 2.5° C. in 40 minutes. It is apparent from these results that any geophysical instrument whose reading is affected by temperature changes must be designated to stand a break of 3° C. in 40 minutes to be of practical use in Texas.--W. Ayvazoglou.

UEBER ISOSTATISCHE SCHWEREANOMALIEN UND DEREN BEZIEHUNG ZU DEN TOTALEN ANOMALIEN

(ON THE ISOSTATIC GRAVITY ANOMALIES AND THEIR RELATION TO THE TOTAL ANOMALIES)

By Heinrich Jung

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 173-178.

Taking into consideration the fact that the expression "isostatic reduction" by which various gravity reductions in connection with the principles of isostasy are known, is often misunderstood and causes confusion, Jung in this article submits the isostatic principles on which E. A. Ansel's isostatic anomalies are based to a close examination and compares them with the known isostatis reductions, especially with those worked out by Hayford.

He examines also the limits of the validity of the following relation calculated by Ansel: $\frac{\Delta G_{is}}{\Delta G'_o} \quad \frac{\varepsilon' - \varepsilon}{\varepsilon}$ in which ε' is the density of the subcrustal material and ε the mean density of the mass of earth.--W. Ayvazoglou.

SCHWERE UND DRUCK IM ERDINNERN

(GRAVITY AND PRESSURE INSIDE OF THE EARTH)

By B. Gutenberg

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 37-41.

The author calculates gravity and pressure inside of the earth under different assumptions of density.

Formulas are derived and the corresponding curves for gravity acceleration and pressure under three different assumptions of density are shown in two figures. Finally Gutenberg examines the change of gravity in the earth's crust.-- W. Ayvazoglou.

SCHWEREREDUCTION UND DREIACHSIGKEIT

(GRAVITY REDUCTION AND THREE AXIALITY)

By F. Hopfner

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 51-57.

Observed values of gravity are reduced by the isostatic method to levels of different potential, according to the elevation of the observed station above sea level. The same is true for Bouguer's and for free-air methods of reduction. All of these methods of reduction do not answer the purpose for which they are projected. Results free from objections from the viewpoint of the potential theory can not therefore be expected when observed values are reduced according to one of these methods.--Author's abstract.

ISOSTASIE UND SCHWEREANOMALIEN

(ISOSTASY AND GRAVITY ANOMALIES)

By W. Heiskanen

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 42-50.

In this article the author proves by several examples that Hopfner has been mistaken in his last papers on the reduction of gravity and on the figure of the earth (Gerlands Beiträge zur Geophysik, vol. 24, No. 4, pp. 378-379 and vol. 25, No. 1, pp. 81-84), that the gravity anomalies noticed and the deflections from the vertical can not be explained by Bruns' term, and that the warping of the geoid according to observations is much smaller than Hopfner would have it. Prey's reduction is also dealt with in the article.--W. Ayvazoglou.

2. MAGNETIC METHODS

UEBER DIE URSACHE DER ERDMAGNETISCHEN STÖRUNG IM GEBIET DER FREIEN STADT DANZIG

(THE REASON OF THE EARTH MAGNETIC DISTURBANCE IN THE REGION OF THE FREE CITY OF DANZIG)

By H. Haalck

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 129-134.

The magnetic survey of the very distinct local anomaly which extends, in the region of the Free City of Danzig, from southeast to northwest has been made by Fr. Errulat (Erdmagnetische Messungen im Gebiete der Freien Stadt Danzig. Mitteilungen der Geophysik. Warte der Universität Koenigsberg, 1929). He measured the distribution of the horizontal and vertical intensities as well as of the declination. The stations were chosen sufficiently close, so that the value and the direction of the disturbance is well known.

The purpose of this article is to give the geological reason for this disturbance, which is not explained by Errulat.

The author examines a profile running perpendicular to the direction of the disturbance. According to the disturbance curves obtained he concludes that the reason for the disturbance must be assigned to masses situated at great depths. Geologically the most probable cause is the existence of crystalline primitive rocks. Haalck shows that no other explanation is probable.

In view of the fact that the Danzig anomaly is caused by crystalline masses the following two possibilities may be expected: (1) The primitive rocks which can be magnetized uniformly rise in the region of disturbance to a shallow depth under the surface of the earth, and (2) in case of a uniform horizontal situation of the crystalline subsoil the different materials inside of them cause the magnetic disturbance.

This anomaly can also be produced by both possibilities at the same time. The two cases are examined theoretically and the conclusion is drawn that the earth-magnetic disturbance can, in general, be explained by both of them; that is, several solutions are possible.

To reduce the ambiguity of the solutions the author recommends that the magnetic proceeding used for the establishment of the substructure be completed by other geophysical methods of prospecting such as seismic and gravimetrical, that is, the pendulum and torsion balance measurements.

After a brief discussion of these methods he concludes that to confine the ambiguity of the explanation of the reasons of the Danzig magnetic disturbance to closer limits the best success can be obtained by the torsion balance measurements. --W. Ayvazoglou.

MAGNETISCHE VERMESSUNG EINIGER TERTIÄRER ERUPTIVGÄNGE UND-STÖCKE IM SÄCHSICHEN ELBSANDSTEINGEBIRGE

(MAGNETIC MEASUREMENTS OF SOME TERTIARY ERUPTION LODES AND ERUPTION STOCKS ON SAXONIAN ELBSANDSTEIN-MOUNTAINS)

By E. G. Schulze

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 141-156.

This field work was carried out from July 23 to September 30, 1927.

1. The instrument. Schmidt's vertical field balance, manufactured by the Askania-Werke was used. The balance was improved by placing two thermometers in the interior part of the balance and the box was provided with a protecting cap lined with cork to prevent too quick a temperature equalization. The instrument proved to be very useful.

2. Measurements. Owing to three favorable conditions (stations very close to one another, security of scale adjustment, and great variations in readings) only about 4 minutes were required for each measurement so that 30 to 50 stations could be made per day. In all, about 2,000 measurements were taken. Figures and maps added to the article give a good picture of the great variations of the disturbance values.

3. Places of investigation. (a) The Zeughaus lode - this deposit is worthy of notice as notwithstanding its great extent it shows a remarkable regularity; (b) deposits near the Klein Pohlshorn; and (c) deposits near Darnsteinweg.

In conclusion the author says that it has been established that the magnetic pole-axis of the rock bodies of all of the investigated basalt deposits does not agree with the position of the earth's field, its direction being in most cases even opposite to it. Therefore, the disturbances can not be explained only by the induction effect of the earth's field and an assumption of the existence of a very regularly developed rock magnetism can be made, the position of the axis of which is in contradiction to the present direction of the induction. Exceptionally great disturbances are explained by the effects of lightning. Magnetic measurements of the eruption rock bodies in the other places of the vast chalk region are desirable.--W. Ayvazoglou.

ÜBER DIE EXISTENZ EINER MONDENTÄGIGEN VARIATION IN DEN ERDSTRÖMEN

(ON THE EXISTENCE OF LUNAR DAY VARIATIONS IN THE EARTH CURRENTS)

By J. Egedal

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 157-158.

In this article Egedal tries to prove the existence of lunar day variations in the earth currents (horizontal electric potential gradients). He shows that the earth current (north-south), measured by the Ebro-Observatory in Spain, is influenced by the moon. The variation is remarkably wide and agrees in phase with the derivation of the function of the tide-equilibrium of the half day wave. A diagram showing the influence of the moon upon the north-east earth current, as observed at the Ebro-Observatory, is given.--W. Ayvazoglou.

MAGNETIC SURVEY IN NEFTE-CHALA IN 1929 (IN RUSSIAN)

By A. I. Zaborovsky

The Petroleum Industry (Moscow), vol. 13, No. 4, 1930, pp. 551-554.

This survey is a continuation of the geophysical investigation of the Nefte-Chala region started in 1928 (See Geophysical Abstracts VIII, December, 1929). The purpose of the survey was to prepare a general magnetic map of the region.

Two instruments for the measurement of the vertical component (Schmidt's balance) and two for the measurement of the horizontal component were used. Observations were made along 19 lines. Curves showing the distribution of the components are given in two figures. Geomagnetic maps are drawn based on the observations.

Zoborovsky compares the results of observations with those obtained in 1928 and mentions the following details:

1. The zone of anomaly becomes larger towards the northwest.

2. The maximum values of the vertical and horizontal components of the magnetic field decrease by advancing northwest.

3. In the center of the zone of anomaly single points appear with minimum values of the vertical force, surrounded by high values of this component.

4. A slight change in the direction of the extent of the zone towards the east was observed.

Analyzing these particularities of anomaly, Zaborovsky draws the following conclusions:

1. The anticlinal fold rises towards the northwest. The laboratory analysis of the magnetic properties of the rocks forming the deposits shows that the magnetic anomaly is caused by the magnetic mineral concentrated mainly near Apsheron, and that the deeper strata contain only a small amount of magnetite. This fact explains the structure of the anticline obtained by the survey.

2. The thickness of deposits situated over the primitive rocks increases towards the northwest, which explains the decrease of the maximum deviations of the components of the magnetic field in this direction from the normal values.

3. The central line of the anticline changes its direction, deviating towards the east near the Kichikbyul-byul hill.

4. From this point on the anticline begins to move downward again, as shown by the decrease of the width of the anomalous strip in this region.—W. Ayvazoglou.

3. SEISMIC METHODS

THE DISPERSION OF SEISMIC WAVES OF THE LOVE TYPE AND THE THICKNESS OF THE SURFACE LAYER OF THE EARTH UNDER THE PACIFIC

By Perry Byerly

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 27-33.

Observations made at the Berkeley seismographic station for 11 years have been studied and data for the dispersion of the first wave of the Love type under the Pacific obtained. If these observations are correlated with wave velocity, they point to a thickness of about 40 kilometers of the surface layer of the earth under the Pacific. If they are correlated with group velocity they point to a thickness of about 20 kilometers. The former correlation is probably the better.—Author's abstract.

4. ELECTRICAL METHODS

UEBER GEOELEKTRISCHE METHODEN MIT DIRECTER STROMZULEITUNG

(ON THE GEOELECTRIC METHODS WITH STATIONARY ELECTRIC CURRENT)

By J. Koenigsberger

Ergänzungs-Hefte fuer angewandte Geophysik, vol. 1, No. 1, 1930, pp. 23-109.

The article is summarized by the author as follows:

"The magnetic field of a dipol of a stationary electric current sent into the earth was calculated and this theoretical field was compared with the observed field of an alternating current of 400 to 500 H frequency. The difference is due to the skin effect which can be divided into two separate effects: The first is due to the effect of the current which is flowing through the wire between the two earth electrodes on the current lines in the earth. The second is due to the mutual induction of the current lines in the earth. The first can be observed near the dipolaxis, the second at a greater distance from the wire on the prolongation of the axis. Theoretically, the conclusion can be drawn that a general enlargement of the dimensions with an unchanged frequency is equal to a higher frequency with original dimensions. Therefore, a greater length of the dipol axis (the distance 2a between the earth electrodes E_1 E_2) always gives greater skin effects. This is proved by experiments. A better conducting soil also gives a greater skin effect than a poorer conducting one."

The author prefers the use of low frequencies of 75 to 450 H to the use of high frequencies of 500 to 1,000 H or more. With low frequencies the change of phase is small, except where ore bodies are concealed in the underground. High frequency complicates the problem. Furthermore, high frequency current does not penetrate deeply enough into the earth.

The change of resistance in parallel, horizontal, infinite layers was deduced by two methods. For a better conductor at a depth, the ratio of two potential differences was calculated and measured on the prolongation of the dipol axis at three points, A, B, C, each distant from the other by "a" ($2a = E_1 E_2$).

For layers having a lower conductivity than normal, another method to measure the ratio of the three intensities of the magnetic field in A, B, and C is more exact. The depth of the upper surface of such a layer can be deduced from the value of "a" for which the ratio is a maximum. The Elbof method was used to determine bodies with two or three dimensions having the same average value as the depth. Some hints and calculations are given for finding the depth of a more or less conducting body from the deviations of the observed field lines in comparison with the normal field direction.

Insulators, such as oil and gas bearing strata and deposits and their upper migration zone, also cause deviations of the field lines.

A stretch of boggy land or a shallow lake on the earth's surface disturbs the horizontal field little, but the vertical field component is much affected by shallow inhomogeneities.

Topography and geological structure exercise strong effects. For detecting ores and for distinguishing ores from other bodies which are better conductors than ordinary soil but not as good as some ores, it is necessary to observe the phase relations directly or indirectly."

The contents of the article are as follows:

1. Introduction.

2. Theoretical normal picture of the current lines of the dipol in an infinite semispace, as well as of its magnetic field for a direct current.

3. Experimental arrangement for the determination of the field.

4. Experimental error limits of measurements of equipotential lines by means of probes and of magnetic dipol fields by means of induction coils.

5. Influence of an alternating current (skin effect, etc.) upon the current lines and the magnetic field.

6. The empirical normal picture of an alternating current (400 to 500 H), of the infinite semispace consisting essentially of two parts and the influence of the skin effect.

7. Theoretical calculations of the potential difference quotient, Q, of the electric field on the surface of the earth in case of an inhomogeneously stratified soil (deposits of a very great extent).

8. Determination of the potential difference quotient, Q.

9. Comparison of the intensities with the forms of the magnetic field on the surface in case of a stratified soil (deposits of a very great extent).

10. Theoretical calculations of the effect of deposits of a smaller extent, spheres and oblate ellipsoids of rotation, upon electric and magnetic field on the surface of the earth.

11. Conclusions for evaluation if geoelectric deflection methods are used; determination of depths of deposits of a not very great extent.

12. Effect of deposits the conductivity of which is not as good as that of the surrounding bodies.

13. Surface disturbances.

14. Effect of geological tectonic and of geological relief.

15. Ores.

16. Angles of tilt.

Thirty three figures illustrate the article.--W. Ayvazoglou.

ZUR MESSUNG DER ELEKTRISCHEN LEITFÄHIGKEIT DER ERDE DURCH INDUKTION

(ON THE MEASUREMENT OF THE ELECTRIC CONDUCTIVITY OF THE EARTH BY INDUCTION)

By J. Koenigsberger

Physikalische Zeitschrift, vol. 31, No. , 1930, pp. 487-498.

A calculation of the vertical component of the magnetic field intensity produced by induced currents is given. These currents are induced in an infinite conducting semispace by means of a circular current of a fixed radius passing through a very fine wire placed on the boundary surface of the semispace. Errors caused by neglecting the skin effect, small phase displacements, and screening are estimated. The half empirical formula derived for the magnetic field of a current in a level wire circle is discussed and examined by observations. Only the first part of this formula is used for the integrations; the errors resulting from this method are estimated. The theory is applied to the earth which is considered a semispace; the observations resulted in a resistance (3.10^4 ohms per cubic centimeter) of the upper layers of the earth of an order that could be expected. To penetrate to depths of over 1 and up to 20 kilometers, frequencies of less than 500 H are required; experimental sources of errors and difficulties are briefly discussed.--Author's abstract translated by W. Ayvazoglou.

LOCATING DEEPLY BURIED BED ROCK

By Irving R. Crosby

Engineering and Contracting, vol. 68, No. 10, 1929, pp. 429-430.

Locating bed rock, learning the nature of the overburden, and studying the character of the rock to determine whether it is suitable to serve as the foundation of a large structure is of great importance. In working out these problems a thorough understanding of the geology of the adjacent country is necessary. The author points out that in at least one of these problems, that is, the locating of bed rock where it is deeply buried, electrical prospecting can be a valuable tool for the geologist. Different types of geophysical prospecting were investigated while studying the geology at the Fifteen Mile Falls development of the New Engla Power Association, on the Connecticut River, with the result that the surface potential electrical method, as applied by the Schlumberger methods, was chosen. The reasons for the rejection of the other methods of geophysical prospecting (gravitational, seismic, magnetic, self-potential, and inductive) are briefly mentioned, and the application of the surface potential method which has been chosen is described.

The results were checked with drill records which showed that they could be depended upon as being within 10 per cent of the correct amount. These results were for depths of 27 to 142 feet, the deeper determinations being more correct.

In discussing the question of electrical prospecting for preliminary studies Crosby states that electrical prospecting can be of use to engineers when time and expense prohibit extensive drilling. It may even be the only possible means of locating bed rock. The author has found in actual practice that the best results can be obtained when the geologist combines the drill information with that obtained by electrical prospecting and studies them as a whole.

In the last paragraph of the article Crosby describes the application of the electrical method on the Connecticut River development. In conclusion he says: "Electrical prospecting is a new and valuable tool for the engineering geologist, and it will help him to solve quickly the problems which the engineer may bring to him."--W. Ayvazoglou.

6. GEOTHERMAL METHODS

DETERMINATION OF GEOTHERMAL GRADIENTS IN OKLAHOMA

By John A. McCutchin

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 5, 1930, pp. 535-555.

This paper deals with the data of geothermal gradients collected from temperature surveys carried on since June, 1928, in approximately 150 wells located in 24 separated fields in Oklahoma and Kansas. The purpose of this investigation is to determine the possibility of using the temperature data for the location of oil pools.

Description of methods and apparatus. The Van Orstrand method has been closely followed in the collection of data. A brief description of the method is given.

Wells suitable for temperature tests. As a rule, the wells that have been drilled with rotary tools are the most unsatisfactory wells in which to make temperature observations because the circulation of the rotary mud in the wells so disturbs the temperature distribution in the formations surrounding the hole that the hole must remain idle for a considerable time (about 30 days) before reliable temperature data can be obtained.

Temperature tests can be made in wells drilled with standard tools at any time the tools are out of the well. Temperature observations should not be made near the bottom of drilling wells as the action of the drill may produce an abnormally high temperature at this point.

Depth-temperature curves. A figure of a depth-temperature curve taken from a deep well in the Tonkawa field is shown. Depth-temperature curves representing wells in temperature equilibrium may, for all practical purposes, be considered as straight lines. However, when a close examination is made the curves are seen to be slightly curved at the shallower depths, the curvature increasing with increasing depth.

Shallow temperatures. The most important temperature data in a well are to be obtained from the first 1,000 feet. As the shallow temperatures act as a guide to the reliability of the data from the entire well, they should be given careful consideration by those endeavoring to correlate temperature data from well to well or area to area.

Explanation of cross sections. Variation in depth to the 80, 90, and 100° F. isothermal surfaces for several places are shown in two figures. The gradient ranges from 1° in 107.0 feet for the wells located near Oklahoma City to 1° in 36.5 and 40.0 feet for the wells located near Tulsa and Okemah. Several possibilities as to the reason for this difference are suggested.

An explanation of the table showing the variations in the gradient computed in terms of feet per degree F. for the fields where tests have been made is given.

An explanation is also given of several figures on which are drawn contours on 80° F. isothermal surface for wells of the Garber field, contours on 100° F. isothermal surface for a portion of the Cromwell field, gradient depth to 100° F. for three wells located on the Haverhill, and contours for 100° F. isothermal surface for wells in the Eldorado, Kansas, field.

Variations in Oklahoma and Kansas fields. Temperature observations have been made in 24 fields in Oklahoma and Kansas. Because the only wells available for testing happened to be temporarily abandoned when the fields were visited, the data from most of these fields are too meager for conclusions to be drawn regarding the variation of temperature with geologic structures. However, it is interesting to note that in only two or perhaps three fields the data collected tended to disagree with the findings of Van Orstrand's previous work in Wyoming and California (Some Evidence on the Variation of Temperature with Geologic Structure in Wyoming and California fields. Economic Geology, vol. 21, No. 2, 1926).

Other uses for temperature data. New and important uses for the accurate temperature data that are being collected in Oklahoma are mentioned.

Conclusions. As a whole, the results obtained in Oklahoma to date on the temperature problem are neither consistent nor inconsistent enough to justify any general conclusions. The results indicate, however, that the problem is not simple and that it will probably be solved by the collection of additional accurate data in the fields and in nonproductive areas, supplemented, perhaps, by some careful work on the heat-conducting properties of sedimentary rocks in a well equipped laboratory.—W. Ayvazoglou.

7. UNCLASSIFIED METHODS

GEOPHYSICAL PROSPECTING IN AUSTRALIA

Editorial note

Industrial Australian and Mining Standard, vol. 83, No. 2140, 1930, p. 312.

In the third annual report of the Council for Scientific and Industrial Research reference is made to the geophysical prospecting campaign which has been proceeding in Australia for the past 13 months. It is stated that a mass of valuable data has been obtained.

The gravimetric section completed its work in the Gelliondale district, Victoria, where it investigated the underground delineation of a bed of brown coal. The deductions drawn from the measured variations of gravity agreed to a reasonable degree of accuracy with the information obtained from bores.

Field investigations of the electrical section have been concluded in the following localities: Anembo and Captain's Flat, near Lake George, New South Wales; Leadville, New South Wales; Woods Point, Victoria; and several areas in the Zeehan and Renison districts of Tasmania.

Indications have been obtained of the existence of ore bodies. Arrangements are now being made for these indications to be tested by bores. In addition to the search for ore bodies attention has been given to the application of the Gish-Rooney method to the search of underground water. This work was carried out in the Victorian Mallee, but the results obtained have been somewhat inconclusive.

The seismic section was established and field work commenced at Gulgong, New South Wales, early in 1929. The section mainly confined its attention to apparatus developed by Major E. H. Booth and the late Prof. Pollack of Sydney University and to Askania seismometer equipment.—W. Ayvazoglou.

GEOPHYSICS - NEWEST SCIENTIFIC AID IN THE SEARCH FOR PETROLEUM

By Bruce Bryan

Oil Bulletin, vol. 16, No. 2, 1930, pp. 132-134 and 200.

In this article Bryan discusses the applicability of geophysical methods of prospecting in California which, so far, have not been very successful in this State.

He examines the following four methods: Seismic, magnetic, electrical, and gravimetric.

After a brief description of the principles of the seismic method, the author concludes that the complex nature of the structures and geology in California makes the use of this method difficult. The more or less populated regions in this State also make the use of artificial earthquakes dangerous.

The magnetic method, which has been used chiefly in mineral prospecting, and in a little work accomplished for oil searching, may become useful for locating oil structures in the future.

The actual commercial value of electrical methods for oil prospecting, particularly in California, has not been thoroughly demonstrated, but the author is of the opinion that a useful technique will ultimately be developed. Three classes of electrical methods, the self-potential, the surface potential, and the inductive method, are briefly described.

The torsion balance, invented by Baron Eötvös, is the fourth method mentioned by Bryan of those in use for geophysical exploring of oil fields in America. A description of the balance and its application is given.

In conclusion the author says that a department of geophysical research and exploration is certainly on the verge of being added to the list of specialist departments and scientific branches of the petroleum industry.--W. Ayvazoglou.

THE CARNEGIE'S SEVENTH CRUISE

By J. A. Fleming

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 5-13.

In this article Fleming summarizes the work done by the "Carnegie" during its seventh cruise, previous to its total destruction as a result of an explosion that occurred on November 29, 1929, in the harbor of Apia, western Samoa.

Among the reports, compilations, and discussions planned and already begun is a narrative account of the cruise, magnetic data and resulting compilations of secular variations, the physical oceanography of the routes traversed, sonic-depth results, earth-inductor measurements at sea of magnetic inclination and horizontal intensity, determination of salinity at sea, gravity observations, chemical and biological results, meteorological observations, radio work, atmospheric-electric results, and confirmation at sea that the principal 24-hour wave of the diurnal variation of the atmospheric potential gradient is according to universal time.

A map of the cruise (from May 1, 1928, to November 29, 1929) showing locations of oceanographical series stations and two tables in which the magnetic work done and the results of chemical, physical, biological, sonic-depth, and bottom-sample data are visualized are added to the article.--W. Ayvazoglou.

REPORT ON THE ACTIVITY OF THE EARTHQUAKE RESEARCH INSTITUTE, TOKYO IMPERIAL UNIVERSITY, IN THE LATTER HALF OF 1929

By Chuji Tsuboi

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 111-122.

The first report on the activity of the Earthquake Research Institute was published in Gerlands Beiträge, vol. 23, No. 4, 1929, pp. 430-441 (see Geophysical Abstracts No. X), in the Institute.

In this report Tsuboi gives a short summary of the work of the Institute under the following headings:

1. Investigations on the deformation of the earth's crust in the Tango district connected with the Tango earthquake of 1927. A map showing the displacement of the secondary triangulation points in the Tango district is added.

2. Eruption of Mount Komagatake. Microseismographs, Ishimoto's tiltometer, and Tsuboi's gravity variometer were used for detecting shocks and changes in the gravitational field in the neighborhood of the volcano. A figure showing lines of equal depression around the volcano prepared by Tsuboi based on a survey carried out by the Land Survey Department is given.

Interesting electric phenomena were observed. A cluster of tremendous lightning flashes is reproduced in a photographic picture.

3. Geophysical investigations. (1) T. Terada proposed a mechanical theory on the form of volcanoes; (2) C. Tsuboi ascertained a remarkable relation between the geographical distributions of the gravitational anomalies and of the positions of the epicenters of earthquake in Japan (illustrated by figures). He continued his observation on the time variation of the second space derivatives of the gravitational potential; and (3) K. Suyehiro developed the observation with his seismic vibration analyser.

4. Instrumental investigations. (1) M. Ishimoto and R. Takahashi designed and constructed an accelerometer for directly recording the acceleration of any motion. This instrument is a kind of seismometer with a very short period and high magnification. A brief description is given. (2) Attention is called to the tilting of the ground as it may be a manifestation of the strain to which the ground is subjected. Ishimoto's tiltometer has been used for these observations. Parallel with this, observations by means of a pair of water levels have also been started. Iron tubes with a length of 18 meters, enameled inside, are installed in a tunnel. They are filled with water and serve as instruments to measure the tilting of the ground. R. Takahashi is making continuous observations, the results of which may be useful for studying the nature of minute tilting of the ground.

5. Seismometrical investigations. (1) A. Imamura, F. Kishinouye, and T. Kodaira discussed the effect of superficial sedimentary layers upon the transmission of seismic waves and (2) A. Imamura examined the vibration of the ground itself, which is induced at the arrival of seismic waves.

6. Mathematical investigations. K. Sezawa studied harmonic Rayleigh waves produced in a dispersive medium by a single impulse applied on its surface. He also pointed out from the results of a mathematical analysis (made in cooperation with G. Nishimura) the existence of a displacement independent of "dilation" and "rotation" in a solid body. Sezawa studied also the generation of Rayleigh waves from a sheet of internal source and the propagation of Love waves on a spherical surface.

7. Geological investigations. (1) H. Tsuya made an exhaustive geological and petrographical study of the volcano Kodzushima, and (2) F. Tada introduced a new method of tracing the crustal movement that a river bed might have suffered.

Detailed accounts of the works mentioned in this paper have already been or will shortly be published in the bulletin of the Earthquake Research Institute.--W. Ayvazoglou.

A BRIEF REVIEW OF ARTICLES APPEARING IN VOLUME 1, NOS. 6 AND 7, OF THE "BOLETIN DE LA ASOCIACION GEOFISICA DE MEXICO."

Boletin de la Asociation Geofisica de Mexico, vol. 1, Nos. 6 and 7, 1929 and 1930, pp. 97-109 and 111-125.

1. Description of the improved "Oertling" type of the Eötvös' torsion balance.

2. Physical principles of the gravimetric method of prospecting, by P. Nikiforov. This is the continuation of the Russian article, translated into Spanish by Prof. Juan Korzujin (see Geophys. Abs. 13 and 14).

3. Results of gravity observations of 1928 near Lake Baskunchak, by B. Numerov. This is a reprint of the article published in the "Zeitschrift fuer Geophysik," vol. 5, No. 7, 1929, of which an abstract was given in Geophys. Abs. 10, February, 1930.

4. Geophysical methods of prospecting (Los metodes geofisicos de exploracion), by Georges-Albert Boutry. The article appeared in "La Révue Pétrolifiere," No. 325, 1929, pp. 821-825. A translation into Spanish made by L. Urguijo, Eng., is given in the "Boletin," vol. 1, No. 7, 1930, pp. 119-125. The translation is to be continued. An abstract of Boutry's article was published in Geophys. Abs. 8, December, 1929.--W. Ayvazoglou.

SUR L'APPLICATION DES METHODES GEOPHYSIQUES A LA PROSPECTION DU SOUS-SOL EN ROUMANIE

(APPLICATION OF GEOPHYSICAL METHODS FOR PROSPECTING THE SUBSOIL IN ROUMANIA)

By T. P. Ghitulescu

Annales des Mines de Roumanie, vol. 13, No. 1, 1930, pp. 7-15.

Taking into consideration the importance of geophysical methods of prospecting and hence the necessity of collaboration of all interested in this science, Ghitulescu gives some results obtained from the work in this field in Roumania.

After a brief historical review of geophysical work in Roumania, the author sets forth the results of study of some typical problems. Results obtained by different methods of geophysical prospecting for the same regions are discussed, and cases in which the geophysical work was proved by drilling are mentioned.

Region of Altan Tepe. Magnetic and electrical methods of prospecting were used. The results of both methods are shown in an accompanying map. The results of measurements obtained by Schmidt's variometer are represented on the map by isogams (from 100 to 100 gamma). Magnetic perturbations reached values of 1,000 gamma. The interpretation of the measurements resulted in the discovery of a small lens (shown in the map). Moreover, some other geological conclusions could be drawn.

The results of electrical prospecting are shown in the same map. This method proved the existence of the small lens, as well as the zone of impregnation discovered by the magnetic method.

Region of Aricesti; study of an anticlinal dome. The region is situated near Ploesti. Electrical prospecting (Schlumberger's method) indicated the anticlinal fold, the line of axis of which agreed with that discovered by direct exploration. A map is added. No interesting indications were obtained by the magnetic method of prospecting.

Region of Calinesti-Floresti-Baicoi. From the geological viewpoint this region is characterized by anticlinal folds of Pliocene and Miocene strata with salt domes distributed in all formations almost up to the surface which, in general, consists of alluvial deposits. The position of the Floresti salt dome was not well known, but more than 25 wells from 20 to 80 meters in depth and seven borings of from 600 to 1,200 meters were made. Only one part of the southern border of the dome could be established. Three different geophysical methods of prospecting were tried in this region: Magnetic, electrical, and gravimetric. The results are given in two maps.

Region of Moreni. This is the most important petroliferous region of Roumania. Direct prospection for petroleum was studied here. After describing the geological structure of this region the author gives the results of the electrical method of prospecting in the region. Two successful boring, shown in a map, were made from the data obtained. The author draws some general conclusions on the possibility of application of geophysical methods in Roumania:

1. Good results were obtained by magnetic methods when the difference of magnetic permeabilities were great enough for producing magnetic perturbations of a certain number of gammas. The application of the magnetic method to the discovery of domes did not give conclusive results.

2. Gravimetric methods have given good results for studying the structure of the subsoil in topographically smooth regions and especially for studying salt domes.

3. Various applications of electrical methods were made. For prospecting for metalliferous deposits the data obtained were in general concordant and sometimes very accurate. Some electrical methods for the study of the structure of the subsoil were very effective and were sufficiently sensitive for obtaining details. The results of a direct prospecting for oil are very encouraging.—W. Ayvazoglou.

LES METHODES DE PROSPECTION GEOPHYSIQUE. LA PROSPECTION DU PETROLE

(METHODS OF GEOPHYSICAL PROSPECTING. PROSPECTING FOR OIL)

By B. Sergescu

Annales des Mines de Roumanie, vol. 13, Nos. 1, 2, 1930, pp. 37-43 and 79-83.

Gravitational, magnetic, and electrical methods of prospecting were discussed by the author in a series of articles published in Nos. 10, 11, and 12, 1929, of the same magazine (see Geophys. Abs. 10). The present articles deal with seismic, radioactive, and geothermal methods.

Seismic methods. Fundamental principles of the method and the construction of the instruments are described. Two types (mechanical and electrical registration) are examined and compared. Velocities of propagation for sandstone (1,800 meters per second), salt (4,800 meters per second), calc-spar (5,000 meters per second), and sediments (about 3,600 meters per second) are given. As an example of the application of the seismic method of prospection the profile obtained by W. Schweydar in Sperenberg is given. In conclusion the author calculates the price of a complete equipment (without radio installation) necessary for seismic exploration, which according to his figures is 400,000 to 500,000 lei.

Radioactive methods. The process of measuring the radioactivity is explained by an example given in a figure.

Geothermal measurements. The reasons for the variation of the temperature, the theoretically calculated value of which increases about 1° C. for each 32 meters of depth if measured towards the center of the earth, are discussed. Sergescu summarizes the local conditions on which these variations depend, as follows: (1) Intense temperature of surrounding rocks which may cause a diminution of the geothermal degree; (2) layers containing radioactive substances which reduce the geothermal degree by freeing their heat; (3) changes of temperature due to running cold or hot water, gas, etc.; (4) chemical reactions by which heat is disengaged; (5) heat caused by friction of layers; and (6) the conductibility of heat by rocks which influences the distribution of the temperature inside of the earth.

The thermometers used for measuring temperatures inside of the earth are described.--W. Ayvazoglou.

DIE DYNAMISCHE VERGRÖSSERUNG VON SCHALLREGISTRIERINSTRUMENTEN FUER ANDAUERNDE SINUSWELLEN

(THE DYNAMIC AMPLIFICATION OF SOUND-REGISTERING INSTRUMENTS FOR CONTINUOUS SINE WAVES)

By B. Gutenberg

Gerlands Beiträge zur Geophysik, vol. 26, No. 1, 1930, pp. 34-36.

The usual sound-registering instruments record continuous sine waves of equal phase differences in the same way that the seismometers record the earthquake waves. The ratio of amplification of a wave of period T to the amplification of very long waves can be derived from the curves for the corresponding ratio for a seismometer with the amplification for very short waves by substituting the reciprocal value for $T : T_0$ (T_0 = self-period).--Aurthor's abstract translated by W. Ayvazoglou.

GEOPHYSICAL PROSPECTING AND THE PROSPECTOR

Editorial note

Canadian Mining Journal, vol. 51, No. 18, 1930, p. 408.

The author of the note expresses the opinion that although geophysical methods of prospecting have become recognized as additional tools of the mining industry they have superceded nothing and that in the discovery of mineral deposits the prospector is just as essential as he ever was. His quest is the first step in the long and orderly march of events that finally culminates in a producing mine and, being the first, is one of the most important steps.--W. Ayvazoglou.

8. GEOLOGY

DIE KONTINENTALEN VERSCHIEBUNGEN VON AMERIKA UND MADAGASKAR

(THE CONTINENTAL DISPLACEMENTS OF AMERICA AND MADAGASCAR)

By R. Livländer

Zeitschrift fuer Geophysik, vol. 6, No. 3, 1930, pp. 134-140.

Livländer tries to derive some facts on the "Displacement of America" based on a great number of accurate observation data of the longitudinal difference of Europe and North America. According to the theory this displacement amounts to about one meter per year.

From the investigations discussed in this article the author draws the conclusion that the displacement of America, if there is any, is considerably smaller than 1 meter per year and may amount to a few centimeters only.

The displacement of Madagascar also remains unproved because the longitudinal data of Madagascar are so far not fitted for any conclusion on this question. The only two measurements of latitude available do not show any displacement.—W. Ayvazoglou.

9. NEW BOOKS

Blanck, Prof. Dr. E. Handbuch der Bodenlehre (Handbook of the study of the soil). Vol. VI; Die Physikalische Beschaffenheit des Bodens (Physical conditions of the soil). 1930, 104 figures, 423 pages. Price: Rm. 43.60; bound, Rm. 46.00. Verlag von Julius Springer, Berlin. Contents: The soil as a substratum; mechanical composition of the soil and phenomena depending on it; mechanical structure of the soil (by Prof. Dr. A. Densch, Landsberg); behavior of the soil with regard to water (by Prof. Dr. F. Zunker); evaporation of water from the soil (by Prof. Dr. M. Helbig); behavior of the soil with regard to air (by Dr. F. Giesecke); behavior of the soil with regard to heat (by Prof. Dr. J. Schubert); and behavior of the soil with regard to electricity and radioactivity of the soil (by Prof. Dr. V. F. Hess). The whole edition will consist of 10 volumes. In addition to volume VI mentioned above, the following volumes are issued so far: Vol. I, Naturwissenschaftliche Grundlagen, 1929, Rm. 27, bound Rm. 29.60; vol. II, Verwitterungslehre, 1929, Rm. 29.60, bound Rm. 32.00; vol. III, Verteilung der Bodenarten, 1929, Rm. 54.00, bound Rm. 57.00.

Hazard, Daniel L. Directions for magnetic measurements. U. S. Department of Commerce, Coast and Geodetic Survey, serial No. 166; 129 pages, 14 figures and 13 tables. Government Printing Office, price 30 cents. Contents: Introduction; bibliography; theory of magnetic measurements - properties of magnets, the earth's magnetism, derivation of formulas, determination of the constants of a magnetometer; and directions for magnetic observations on land - general directions, equipment, latitude from observations of the sun, latitude from observations of Polaris, determination of the true meridian and local mean time by observations of the sun, determination of the true meridian by observations of Polaris, determination of the true meridian by observations of the sun at apparent noon, latitude and azimuth from star observations, determination of the magnetic declination, determination of the dip, determination of the horizontal intensity, determination of the total intensity, investigation of regions of local disturbance, directions for observations at sea, operation of a magnetic observatory, and earthquakes.

Rothé, E. Les Méthodes de Prospection du sous-sol. (Methods of subsoil prospection). 392 pages, 156 figures. Price 75 francs; Gauthier-Villars, quai des Grands-Augustins, Paris. Contents: Part I.- Magnetic method. Chapter I, Methods and instruments. A. Absolute methods. (1) Measurement of declination; (2) measurement of inclination; and (3) measurement of the horizontal component H. B. Relative methods. (1) Variations at one point; (2) variation from one point to another; and (3) universal variometer (Haalck), manipulation. Chapter II, Application of magnetic method. Chapter III, Interpretation of the results. Part II.- Electrical method. Chapter IV, Methods and instruments, manipulation. Chapter V, Application of the electrical method. Part III.- Seismic method. Chapter VI, Methods and instruments, manipulation. Chaper VII, Experience and interpretation. Part IV.- Gravitational methods. Chapter VIII, Potential and its derivatives, their use. Chapter IX, Apparatus. Chapter X, Topographic corrections, Chapter XI, Interpretation and examples.

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